

**ROCKY FLATS ENVIRONMENTAL
TECHNOLOGY SITE**

**EMD OPERATING PROCEDURES
MANUAL VOL. VI. AIR**

Manual No..

Procedure No..

Page:

Effective Date.

Organization:

5-21000-OPS-AP

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03/23/95

Environmental Management

THIS IS ONE VOLUME OF A SIX VOLUME SET WHICH INCLUDES.

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AP 01	4-C97-ENV-AQ 01 Effluent Tritium Sample Collection	0*	03/18/94
* This document is a complete revision of document 5-21000-OPS-AP 01,R0			
AP 02	4-C98-ENV-AQ 02 Tritium Sampler Calibration	0*	03/18/94
* This document is a complete revision of document 5-21000-OPS-AP 02,R0			
94-DMR-001850	New Calibration Rotometer	0	09/28/94
AP 03	4-C83-ENV-AQ 03 Effluent Air Radioparticulate Sample Collection	0*	06/01/94
*This document is a complete revision of document 5-21000-OPS-AP 03,R0			
94-DMR-001845	Effluent Travelers & COC Sheets Collection	0	09/27/94
AP 04	4-C82-ENV-AQ 04 Effluent Air Radioparticulate Sampler Calibration	0*	06/01/94
* This document is a complete revision of document 5-21000-OPS-AP 04,R0			
AQ 06	4-E71-ENV-AQ 06 Air Flow Velocity Measurement	0	3/23/95
AP 08	Volumetric TSP/PM ₁₀ Calibration , Ambient Air Particulate Sampling High Volume Method	0	10/01/91

DOCUMENT CLASSIFICATION REVIEW
FOR R.B. HOFFMAN, CLASSIFICATION
JUNE 11, 1991

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AP 09	Ambient TSP/PM ₁₀ Air Particulate Sampling High Volume Method	0	10/01/91
AP 10	Radioactive Ambient Air Monitoring Particulate Sampling Data Reduction	0	10/01/91
AP 11	Mass Flow TSP/PM ₁₀ Calibration, Ambient Air Particulate Sampling High Volume Method	0	10/01/91
•AQ 11	4-D21-ENV-AQ 11 Air Emissions Reporting and Permitting for New and Existing Sources	0	07/06/93

This procedure will be replacing AP 11. The procedure, AP 11, will be combined with the procedure, AP 08, be renamed AQ 08, and be placed inside this manual. **This document, AQ 11, was issued with a limited distribution list.** It can be requested as a stand-alone, or as part of the entire manual.

AP 12	Placement, Design, Installation, and Operation of Meteorological Monitoring Stations		
AP 13	Radioactive Ambient Air Monitoring Program	0	10/01/91
AP 14	Meteorology Data Downloading		
AP 15	Restoration Projects Data Reduction for Radioactive Ambient Air Monitoring	0	10/01/91
AP 16	4-D31-ENV-AQ 16 Restoration Projects Ambient Air Particulate Sampling (High Volume Method)	0*	05/26/94
*This document is a complete revision of 5-21000-OPS-AP 16,R0			
AP 17	Sampling Procedure, Volatile Organic Compounds Method TO-14	0	10/01/91
AP 18	Sampling For Organochlorine Pesticides and Polychlorinated Biphenyls in Ambient Air (SVOD)	0	10/01/91

Rocky Flats Environmental Technology Site

4-E71-ENV-AQ.06

REVISION 0

AIR FLOW VELOCITY MEASUREMENT

APPROVED BY *R. C. Nininger* / R. C. Nininger / 3/22/95
 Air Quality Branch Manager Print Name Date

Responsible Organization Air Quality Branch Effective Date 03/23/95

CONCURRENCE BY THE FOLLOWING DISCIPLINES IS DOCUMENTED IN THE PROCEDURE HISTORY FILE

Analytical Services
 Engineering and Safety Services
 Metrology
 Performance Assurance
 Radiological Engineering
 Radiation Operations
 Radionuclide National Emission Standards for Hazardous Air Pollutants Representative
 Subject-matter Expert

APPROVAL FOR IMPLEMENTATION IN THE FOLLOWING BUILDINGS OR LOCATIONS IS DOCUMENTED IN THE PROCEDURE HISTORY FILE

371	374	444	447	559	561
707	729	771	774	776	777
778	779	782	865	875	881
883	886	889	991		

USE CATEGORY 3

SORC review 95-013 (03/21/95)

The following has been incorporated in this revision
 94-DMR-001122

No DOE or EPA approval needed. RCN 3/23/95
 Periodic review frequency 3 years from the effective date

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By *Mary K. Fore* (U/N4)
 Date 3/22/95

LIST OF EFFECTIVE PAGES

<u>Pages</u>	<u>Effective Date</u>	<u>Change Number</u>
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1. PURPOSE

This procedure provides instructions for obtaining data used in the calculation of the volumetric air flow through an air effluent exhaust duct using Environmental Protection Agency (EPA) Reference Methods 1 and 2, or 1A and 2A [40 Code of Federal Regulations (CFR) 60, Appendix A, Test Methods]. This activity supports the quantification of pollutants to the environment and public as required in 40 CFR 61, Subpart H, National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities.

2. SCOPE

This procedure applies to Rocky Flats Environmental Technology Site employees and subcontractors who perform as Air Quality Project Managers, Metrology Technicians, and Radiological Control Technicians (RCT).

This procedure applies sitewide for all air effluent exhaust ducts, stacks, or vents.

This procedure addresses the measurement criteria and methods for obtaining differential pressure readings using either a standard s-type, or a three-dimensional Pitot tube for determining the duct effluent velocity and volumetric flow rate following EPA Reference Methods 1 and 2, or 1A and 2A.

3. LIMITATIONS AND PRECAUTIONS

- An RCT shall be present during the air flow velocity measurement test, where applicable.
- Air flow velocity measurement tests shall be performed with a Radiation Work Permit (RWP), where applicable. (HSP 6 07)
- Personal protective equipment (PPE) shall be worn as required by the RWP, where applicable.
- To comply with the intent of the As Low As Reasonably Achievable (ALARA) Program, all personnel shall apply the principles of time, distance, and shielding when working in radiological areas.

3. LIMITATIONS AND PRECAUTIONS (continued)

- Fall protection shall be used in accordance with HSP 22.05, Fall Protection and Equipment, where applicable.

4. PREREQUISITE ACTIONS

4.1 Planning and Coordination

Air Quality Project Manager or Designee

- [1] Ensure that the air flow velocity measurement test personnel receive the following training:
- Indoctrination
 - Hands-on training
 - Qualification
 - Fall protection safety training, where applicable.

Metrology Personnel

- [2] Verify that two Metrology Technicians (one qualified and one other Metrology Technician) are trained in the use of this procedure and that they are available for the performance of this procedure.

One Metrology Technician traverses the duct with the Pitot tube while the other technician takes differential pressure readings from the manometer.

- [3] Verify that the building Operations Manager or designee has given approval for the air flow velocity measurement activities.
- [4] Verify that the air flow velocity measurement activity has been scheduled on the building Plan of the Day in accordance with 1-31000-COOP-016, Plan of the Day (POD)
- [5] Verify that the air flow velocity measurement activity has an RWP, where applicable.
- [6] Ensure that an RCT is available for the air flow velocity measurement activity, where applicable.

4.1 Planning and Coordination (continued)

- [7] Ensure that a pre-evolution briefing has been held in accordance with 1-31000-COOP-011, Pre-evolution Briefing.
- [8] Verify with the building Stationary Operating Engineer (SOE) that the ventilation systems to be tested (plenums and fans) are operating normally.
- [9] IF the subject ventilation system is NOT operating normally, THEN exit this procedure until system operation is restored.

4.2 Performance Documents

Metrology Technician

- [1] Obtain Appendix 1, Velocity Traverse Data, from the Air Quality Project Manager or Designee.
- [2] Obtain the appropriate Sampling Point Location Data sheet from the Air Quality Project Manager or Designee
- [3] Obtain EPA Reference Method 1, Sample and Velocity Traverses for Stationary Sources, if applicable.

4.3 Materials and Equipment

4.3.1 Measuring and Test Equipment (M&TE)

Metrology Technician

- [1] Obtain the following M&TE, or equivalent, as needed:
 - Calibrated Pitot tube of appropriate length and type
 - Calibrated Dwyer 10-in. inclined manometer
 - Calibrated thermocouple wire, \pm one degree when combined with thermocouple meter
 - Calibrated thermocouple meter, \pm one degree when combined with thermocouple wire
 - Calibrated absolute pressure gauge, \pm 0.1 in. Hg

4.3.1 Measuring and Test Equipment (M&TE)

- [2] Ensure that all M&TE has current calibration stickers.
- [3] Replace any equipment that is defective or has an expired calibration sticker.

4.3.2 Special Tools and Equipment

Metrology Technician

- [1] Obtain the following Special Tools and Equipment, as needed:
 - Pitot tube umbilical cord (Tygon tubing)
 - Port sealing cloth or rubber plugs
 - Ladder, scaffolding, or man lift (supplied by Building)
 - Tape measure
- [2] Obtain fall protection equipment, as needed.

4.3.3 Consumables

Metrology Technician

- [1] Ensure that the following consumables are available for use, as appropriate:
 - Red gauge oil
 - Black wax marker
 - Vinyl tape

4.4 Field Preparation

Metrology Technician

- [1] Obtain the appropriate authorization and/or approvals from the Operations Manager or designee.
- [2] Obtain the RWP, where applicable.
- [3] Verify that RCT support is available, where applicable.

4.4 Field Preparation (continued)

[4] Verify that SOE support is available.

[5] Obtain and don the proper PPE in accordance with the RWP, where applicable.

5. INSTRUCTIONS

Metrology Technician

- [1] Verify that all prerequisites in Section 4, Prerequisites Actions, are complete, and document in Appendix 1.
- [2] IF, at any time, discrepancies or difficulties are encountered that CANNOT be resolved within the scope of the procedure, such as loss of airflow,
THEN:
 - [A] Stop work immediately.
 - [B] Inform supervision of the discrepancy.

RCT

- [3] Perform a pre-job survey in accordance with Radiological Operating Instructions (ROI), where applicable.

Metrology Technician

- [4] Obtain the appropriate Sample Point Location Data Sheet for the duct to be tested.
- [5] IF there is NO Sample Point Location Data Sheet for the duct to be tested,
THEN:
 - [A] Obtain a blank data sheet from the Air Quality Project Manager or Designee.
 - [B] Determine the number of traverse points and penetration depths in accordance with EPA Reference Method 1, Sample and Velocity Traverses for Stationary Sources.

NOTE *The depth of the port and duct wall measurements may be available on the bottom left-hand corner of the appropriate Sampling Point Location Data sheet.*

- [6] Determine the depth of the port and duct wall using a measuring tape.

5. INSTRUCTIONS (continued)

- [7] Add the port or duct wall depth to each of the *Inches from Near Wall* values that is found in the matrix at the bottom right-hand corner of the appropriate Sampling Point Location Data sheet.
- [8] Attach the thermocouple wire to the Pitot tube with tape, as needed.
- [9] Do NOT use a permanent marker to mark penetration depths on the Pitot tubes.
- [10] Mark the traverse point depth on the Pitot tube with a black wax marker or vinyl tape.
- [11] Connect the thermocouple meter to the thermocouple wire.
- [12] Open the manometer tubing connectors.
- [13] Connect the short side of the Pitot tube to the high or low side manometer tubing connector using the umbilical cord.
- [14] Connect the long side of the Pitot tube to the remaining manometer tubing connector using the umbilical cord.
- [15] Record the following pretest information on Appendix 1 before starting the test:
 - Building
 - Location
 - Test number
 - Barometric pressure
 - Date
 - Data taken by (enter employee number)
 - Test description
 - Pitot tube coefficient (0.99 for standard Pitot tubes, 0.84 for s-type Pitot tubes)
 - Equipment calibration control numbers and due dates (in the bottom right-hand corner of the field data sheet)

5. INSTRUCTIONS (continued)

- [16] Conduct a pre-leak check on the Pitot tube and manometer assembly, and document in Appendix 1.

5.1 Test Procedure

Metrology Technician

- [1] Open a sample port on the duct by removing the flange or port cap.
- [2] Place a port sealing cloth or plug with center hole for Pitot tube over the port opening to prevent excessive escape of effluent air from the duct or to prevent excessive ambient air from entering the duct.

NOTE *A positive static pressure will force exhaust air out of the duct, while a negative static pressure will pull ambient air into the duct*

- [3] Rotate the Pitot tube in the effluent stream so that the manometer reads 0 in. of water during one of the traverse point pressure measurements.
- [4] **IF** the duct static pressure is positive,
THEN:
- [A] Detach the umbilical cord from the right side of the manometer.
- [B] Record the duct static pressure reading from the manometer on Appendix 1.
- [5] **IF** the duct static pressure is negative,
THEN:
- [A] Detach the umbilical cord from the left side of the manometer.
- [B] Record the duct static pressure reading from the manometer on Appendix 1.
- [6] Penetrate the duct with the Pitot tube, stopping at the first traverse point demarcation.

5.1 Test Procedure (continued)

[7] Seal around the Pitot tube with the sealing cloth or plug as it is moved into the duct.

[8] Rotate the Pitot tube to ensure that the total pressure input of the Pitot tube is facing directly into the axial flow of the effluent stream.

This orientation will represent a positive displacement on the manometer gauge.

[9] Record the following information on Appendix 1 under the corresponding columns:

[A] Enter the time of day, using military time, in the Time column.

[B] Enter the port letter in the Port column.

[C] Enter the traverse point number in the Point column.

[D] Enter the pressure reading from the manometer in the Vel. Head ΔP , in. H₂O column.

[E] Enter the temperature from the thermocouple meter in the Duct Temp. °F column.

[10] Move the Pitot tube to the next traverse point as indicated by the next demarcation on the Pitot tube.

[11] Align the Pitot tube as stated in Step [8].

[12] Repeat Steps [9] through [11] until readings from all traverse points have been taken.

[13] Remove the Pitot tube and sealing cloth or plug from the port.

5.1 Test Procedure (continued)

[14] Perform one of the following to seal the port:

[A] Attach the port cap or flange to the port.

[B] Place a solid block port plug in the port to form a temporary port seal, as appropriate.

[15] Move to the next port, and repeat Steps [1] through [14] until all measurements have been recorded.

[16] Attach the disconnected umbilical cord to the manometer.

[17] Perform Steps [1] through [15] at least twice more.

The additional tests provide a statistically meaningful volumetric flow rate.

[18] Record the additional tests as Test 2, Test 3, etc., on the Test No. line of Appendix 1.

[19] Perform a post-test leak check on the Pitot tube, and document in Appendix 1.

[20] IF the post-test leak check of the Pitot tube fails,
THEN repeat Steps [1] through [19].

[21] Disconnect the thermocouple meter from the thermocouple wire.

[22] Disconnect the umbilical cord from the manometer and Pitot tube.

[23] Close the manometer tubing connectors.

[24] Remove the penetration depth marking from the Pitot tube.

[25] Ensure that the port caps or flange to the ports are installed.

5.1 Test Procedure (continued)

RCT

- [26] Perform the necessary contamination surveys, where applicable, in accordance with ROIs, paying particular attention to:
- Hands.
 - Port sealing cloth or plug.
 - Pitot tube.

6. POST-PERFORMANCE ACTIVITY

6.1 Restoration

Metrology Technician

- [1] Return all tools and equipment to the appropriate storage area.
- [2] Dispose of any waste in accordance with 4-D99-WO-1100, Solid Radioactive Waste Packaging Inside of the Protective Area, or 4-C77-WO-1101, Solid Radioactive Waste Packaging Outside of the Protective Area, where applicable.
- [3] Inform building Operations Management that air flow velocity measurement activities are complete.

6.2 Disposition

Appendix 1 is a Quality Assurance record that is generated by this procedure.

Metrology Technician

- [1] Deliver copies of Appendix 1 to the building Operations Management.
- [2] Deliver original Appendix 1 to the Air Quality Project Coordinator or the Program Manager.

Air Quality Project Manager or Designee

- [3] Ensure that any identified deficiencies or requests for modifications to facilities, systems, equipment, or grounds is submitted in accordance with 1-E32-IWCP-1, Work Control Form Processing.

6.2 Disposition (continued)

- [4] Perform data reduction of Appendix 1 in accordance with EPA Reference Method 2.**
- [5] File and maintain records in accordance with 1-77000-RM-001, Records Management Guidance for Records Sources.**

7. REFERENCES

HSP 6.07, Radiation Work Permit

HSP 22.05, Fall Protection and Equipment

1-E32-IWCP-1, Work Control Form Processing

1-31000-COOP-011, Pre-evolution Briefing

1-31000-COOP-016, Plan of the Day (POD)

1-77000-RM-001, Records Management Guidance for Records Sources

4-C77-WO-1101, Solid Radioactive Waste Packaging Outside of the Protective Area

4-D99-WO-1100, Solid Radioactive Waste Packaging Inside of the Protective Area

40 CFR 60, Appendix A, Test Methods

40 CFR 60, Appendix A, Reference Method 1, Sample and Velocity Traverses for Stationary Sources

40 CFR 60, Appendix A, Reference Method 1A, Sample and Velocity Traverses for Stationary Sources with Small Stacks or Ducts

40 CFR 60, Appendix A, Reference Method 2, Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

7. REFERENCES (continued)

40 CFR 60, Appendix A, Reference Method 2A, Direct Measurement of Gas Volume Through Pipes and Small Ducts

40 CFR 61, Subpart H, National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities

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VELOCITY TRAVERSE DATA

EPA Method 2 or 2A

Pre-Leak Check Pass (initial) _____ **Post-Leak Check Pass (initial)** _____

EPM/AQD